The Fisheye of the Comet Interceptor's EnVisS Camera

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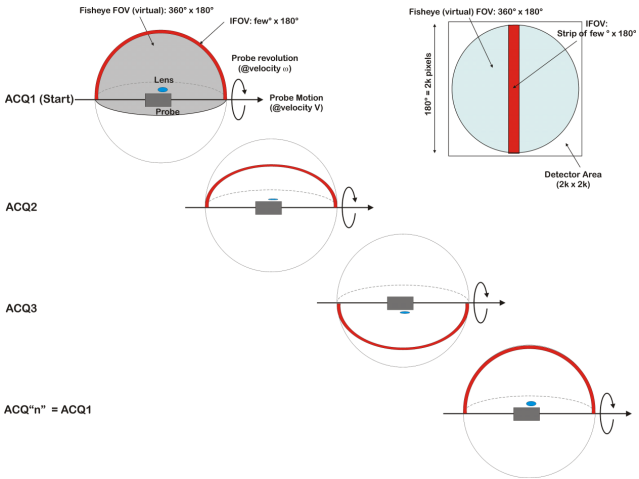
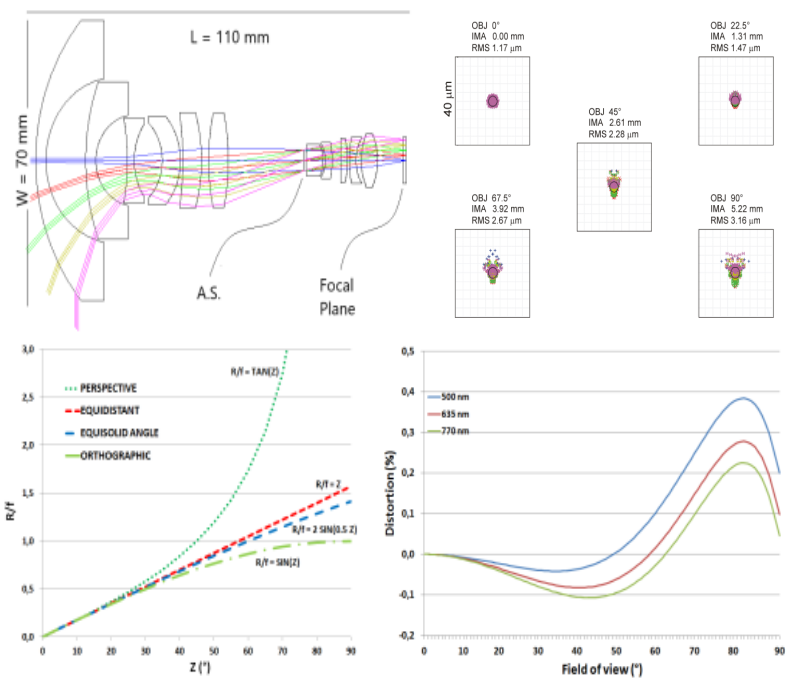
ABSTRACT

EnVisS (Entire Visible Sky) is an all-sky camera specifically designed to fly on the space mission Comet Interceptor. This mission has been selected in June 2019 as the first European Space Agency (ESA) Fast mission, a modest size mission with fast implementation.

This work will describe the F-Theta telecentric lens designed for the EnVisS camera (bottom panels). It also briefly describes the image acquisition operational mode procedure (right panel).



How EnVisS create a full immersive image of the comet tail from inside: Each single image is composed by a strip of few degrees times 180°. A continuous series of strips are collected while the probe is moving and spinning. Stitching of such stripes permit the reconstruction of a full immersive image of the tail as view from its interior.



EnVisS fisheye is composed by 11 lenses where the front two are made in rad-hard glasses (top-left). Spot size shows as the optical quality is diffraction limited on the axis and pixel limited at the extreme fields (top right). The sky is mapped with an equidistant projection function, which means that each pixel maps the same angular portion of the sky (red line in the bottom left panel, other types of fisheye projection functions are shown for comparison). Deviation from equidistant projection is very low: below 0.5 % on the whole field (bottom right), i.e. the fisheye works in F-Theta condition. Deviation from telecentric condition is 4° maximum for the chief ray at the marginal field.

CONCLUSIONS

This work describes the EnVisS fisheye lens in terms of:

1. Optical Quality.
2. Sky mapping projection function
3. F-Theta distortion.
4. Deviation from telecentric condition.

These parameters are all necessary for a correct processing of full immersive image reconstruction of the comet tail from inside, which is the goal of the Comet Interceptor EnVisS camera.

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